# System of Systems Engineering Collaborators Information Exchange (SoSECIE)

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## An Evolution of Usability Analysis: The System of Systems Usability (SoS-U) Framework

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**Abstract**
Although the number and scope of System of Systems (SoS) steadily increases, current usability assessment techniques remain ill-equipped to handle the constraints inherent to Commercial Off The Shelf (COTS) / Government Off The Shelf (GOTS) technology integrations. Standard usability techniques are designed to focus on within-system (individual) information flows and human-machine interactions. Usability results are thus limited to inform the design of that system. Yet, a successful SoS approach also requires effective between-systems usability. Ineffectively measuring or ignoring between-systems usability leads to unrealized Human Systems Integration (HSI) risks. This contributes to human performance decrements that are not realized until the testing phase, thus resulting in unexpected and costly re-work.

This presentation contains a description of a Systems of Systems Usability (SoS-U) framework for tools designed to fulfill this capability gap in SoS usability assessment. Four interrelated categories of tools and their functions are described. First, task and information ontologies and labels can be applied to user workflows and DoDAF diagrams to visualize and search the SoS usability space, user interface development constraints, and key information flows. Second, compilations of SoS-relevant usability heuristics/principles (e.g., “provide visibility of system status”) can be used to identify the SoS’s core usability issues. Third, prioritization and categorization methods of usability test outputs provide timely and appropriate improvements to relevant workflows, developmental items, and training efforts. Fourth, the design and integration of SoS-specific models and simulations quantify usability improvements in terms of human and system performance.

For HSI practitioners, this framework supports the scoping, feasibility, and prioritization of SoS-related usability analysis and improvements. For SoS systems engineers, these improvements support activities such as workflow design, architecture design, modeling and simulation, configuration management, and trade space decisions. This framework especially benefits the design of between-systems “glueware” such as alert/alarm displays, status displays, enterprise-level interfaces, and widget configurations. In summary, SoS-U provides a tailored approach for aligning usability approaches and outcomes with respect to the realities of the COTS/GOTS integration environment.

**Biographies**
Mr. Lacson is a Human Factors Engineer at Pacific Science & Engineering Group (PSE) with expertise in assessing the interactions between humans and complex systems. He has over 10 years of applied human factors research and engineering experience within academia, government, and DoD organizations. Mr. Lacson performs human systems integration and human factors engineering analyses and research that focuses on the quantitative application of HFE principles, methods, and standards. Specifically, he

conducts modeling & simulation, design of experiments, and workflow/DoDAF analysis in support of the HSI process for DoD acquisition. He earned his B.S. in Industrial Engineering and his M.S. in Engineering Psychology from the University of Illinois, Urbana-Champaign.

Dr. Risser is a Senior Human Factors Scientist at Pacific Science & Engineering Group (PSE) with expertise in designing and assessing interactions between humans and complex systems. He has over 16 years of applied human factors research and engineering experience within academia, government, and DoD organizations. Dr. Risser performs human systems integration and human factors engineering analyses, design, and testing to support SPAWAR, PEO C4I, and PEO EIS in the development of Navy C4ISR and Enterprise Information systems. Dr. Risser's work includes the application and practice of HFE principles, methods, and standards in support of the HSI process for DoD acquisition to reduce human error, facilitate decision-making, and improve system reliability. He earned his Ph.D. in Industrial/Organizational Psychology from Old Dominion University with an emphasis in Human Factors Engineering and additional study in Engineering Management.